SOU44081 — Computational Social Science

Module Information	
Module Code	SOU44081
Module Title	Computational Social Science
Department	Sociology
Year Group	Senior Sophister
Module Personnel	Professor Taha Yasseri
Academic Year	2026-27
Credit Weighting	10 credits
Semester	Semester 1
Contact Hours	2 lectures per week

Module Content	
Module Description	This module provides an introduction and discussion of the key principles and concepts in computational social science (CSS). The main approaches in the field are introduced – beginning with a historical background to the main developments, up to and including an introduction to the most recent developments and applications of the methodological approaches discussed. In particular, this module provides the student with an overview of four main areas in the CSS field. Where possible the discussion of topics in this module will be enhanced by presentation and discussion of some empirical examples and applications from industry, NGOs, and the public sector.
Module Learning Aims	
Learning Outcomes	On successful completion, students will: • Have acquired a good overview knowledge of the main theories of the CSS paradigm as casual explanatory frameworks that shed new light on the nature of human and social dynamics • Be able to identify and discuss a number of key methodological tools in CSS: present the main classes of entities, objects and relations common to the computational analysis of social complexity

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	• Be able to identify some of the main applications of this field in industry, NGOs, and the public sector.
Indicative Reading / Resources	There is no specific textbook assigned to this module. Each week we will discuss different pieces and in particular we will focus on examples of a research paper relevant to the topic of the course. Please see the tentative list below. Additional readings, generally journal articles and examples from current events, will be assigned throughout the term. A general reference however is: Yasseri, T. (Ed.). (2025). Handbook of computational social science. Edward Elgar Publishing. https://doi.org/10.4337/9781802207309 Lecture 1: Introduction Required Reading: • Lazer, D., Pentland, A., Adamic, L., Aral, S., ... & Jebara, T. (2009). Computational social science. Science, 323(5915), 721-723. • Yasseri, T., What is Social Data Science and how is it done? Sage https://campus.sagepub.com/blog/what-is-social-data-science. 1. Wallach, H. (2018). Computational social science≠ computer science+ social data. Communications of the ACM, 61(3), 42-44. Lecture 2: Data Collection and Observational Studies Optional Readings: • Kosinski, M., Stillwell, D., & Graepel, T. (2013). Private traits and attributes are predictable from digital records of human behavior. Proceedings of the national academy of sciences, 110(15), 58025805. • Preis, T., Moat, H. S., Stanley, H. E., & Bishop, S. R. (2012). Quantifying the advantage of looking forward. Scientific reports, 2(1), 1-2. Lecture 3: Data Mining and Text Mining Required Readings: • Melville, S., Eccles, K., & Yasseri, T. (2019). Topic modeling of everyday sexism project entries. Frontiers in Digital Humanities, 5, 28. Optional Readings: • Lakshmi, B. N., & Raghunandhan, G. H. (2011, February). A conceptual overview of data mining. In

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2011 National Conference on Innovations in Emerging Technology (pp. 27-32). IEEE.

- Lerman, K. (2018). Computational social scientist beware: Simpson's paradox in behavioral data. Journal of Computational Social Science, 1(1), 49-58.

Lecture 4: Social Network Analysis
Required Reading:

- Network Literacy: Essential Concepts And Core Ideas, https://sites.google.com/a/binghamton.edu/netscied/teaching-learning/network-concepts

Optional Reading:

- Mark S. Mizruchi, Network Theory (2005), In Encyclopedia of Social Theory, Network Theory, Sage. https://doi.org/10.4135/9781412952552.n205
- Weng, L., Menczer, F., & Ahn, Y. Y. (2013). Virality prediction and community structure in social networks. Scientific reports, 3(1), 1-6.

Lecture 5: Middle Range Theories and Social Networks
Optional reading:

- Holme, P., & Liljeros, F. (2015). Mechanistic models in computational social science. Frontiers in Physics, 3, 78.
- Albert, R., & Barabási, A. L. (2002). Statistical mechanics of complex networks. Reviews of modern physics, 74(1), 47. 2

Lecture 6: Temporal Analysis
Optional Readings:

- Yasseri, T., Sumi, R., & Kertész, J. (2012). Circadian patterns of wikipedia editorial activity: A demographic analysis. PloS one, 7(1), e30091.
- Aledavood, T., Lehmann, S., & Saramäki, J. (2015). Digital daily cycles of individuals. Frontiers in Physics, 3, 73.
- Aledavood, T., López, E., Roberts, S. G., Reed-Tsochas, F., Moro, E., Dunbar, R. I., & Saramäki, J. (2015). Daily rhythms in mobile telephone communication. PloS one, 10(9), e0138098.
- Goh, K. I., & Barabási, A. L. (2008). Burstiness and memory in complex systems. EPL (Europhysics Letters), 81(4), 48002.

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- Barabasi, A. L. (2005). The origin of bursts and heavy tails in human dynamics. Nature, 435(7039), 207-211.

Lecture 7: Spatial Analysis
Optional Readings:

- Brockmann, D., & Helbing, D. (2013). The hidden geometry of complex, network-driven contagion phenomena. Science, 342(6164), 1337-1342.
- Mandelbrot, B. (1967). How long is the coast of Britain? Statistical self-similarity and fractional dimension. Science, 156(3775), 636-638.

Lecture 8: Experimentation
Required reading:

- Ishowo-Oloko, F., Bonnefon, J. F., Soroye, Z., Crandall, J., Rahwan, I., & Rahwan, T. (2019). Behavioural evidence for a transparency–efficiency tradeoff in human–machine cooperation. Nature Machine Intelligence, 1(11), 517-521.

Optional Readings:

- Chapin, F. S. (1917). The experimental method and sociology. The Scientific Monthly, 4(2), 133.
- Yasseri, T., & Reher, J. (2019). Fooling with facts: Quantifying anchoring bias through a large-scale online experiment. arXiv preprint arXiv:1911.12275.

Lecture 9: Agent-Based Simulations
Required reading:

- Schelling, T. C. (1971). Dynamic models of segregation. The Journal of Mathematical Sociology, 1(2), 143–186. https://doi.org/10.1080/0022250X.1971.9989794

Optional reading:

- Conte, R., Gilbert, N., Bonelli, G., Cioffi-Revilla, C., Deffuant, G., Kertesz, J., ... & Helbing, D. (2012). Manifesto of computational social science. The European Physical Journal Special Topics, 214(1), 325-346.

Lecture 10: Ethics and CSS
Optional Readings:

- Giglietto, F., & Rossi, L. (2012). Ethics and interdisciplinarity in computational social science. Methodological Innovations Online, 7(1), 25-36.

Module Content	
	• Central University Research Ethics Committee (CUREC) Best Practice Guidance 06 version 7.1 Internet-mediated research https://researchsupport.admin.ox.ac.uk/files/bpg06internetbasedresearchpdf

Assessment	
Assessment Components	• Weekly assignments (50%) • End-of-trimester Essay and Presentation (50%)
Assessment Details	Weekly Assignments: Short assignments that do not require coding, but will give the students the opportunity to work with real research data. End-of-trimester Essay and Presentation: Each student gets to present a research paper assigned to them and write a critical piece on it.

Additional Information	
Prerequisites	None
Co-requisites	None
Any other information	